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FISSION TRACK DATING OF APATITES 725, HAY-1 AND 1021 B

R.C. McCorkell

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by

R.C. McCorkell

The geological ages of three apatite specimens, 725, HAY-1 and 1012 B were measured by the fission track method.

Keywords: Fission Track; Dating; Apatite

FISSION TRACK DATING OF APATITES 725, HAY-1 AND 1021 B

PROCEDURE

The procedure used in measuring the ages of these specimens was essentially the same as that described in our earlier report (MRP/MSL 86-22). The only significant change was that the mounted and polished grains were etched 30 seconds in 7% HNO_3 rather than in concentrated HNO_3 for 25 seconds. It was found that this resulted in fission tracks with more distinctive shapes. This was important as these apatite crystals contained high concentrations of inclusions, fractures, internal grain boundaries, etc. which obscured fission tracks and in many cases, resemble and could be confused with them. These features were the chief source of difficulty in dating these specimens, and probably the chief source of errors and uncertainty in the resulting ages. The appearances of the etched surfaces, of the fission tracks, and of the other features varied greatly among the grains in a sample and no doubt errors were sometimes made in deciding what should be counted as fission tracks. It is probable that for this reason the uncertainties in the ages are greater than indicated in the table (which were calculated to 1σ from the numbers of tracks counted) and that counting more tracks would not greatly reduce them.

These specimens were also unusual in having low densities of both fossil and neutron-induced fission tracks. Most apatites described in the literature of fission track dating have high ρ values when they have such ages as found here and after they have received neutron doses such as used here [$(3.512)10^{14}$ n/cm^2 as measured with N.B.S. dosimeter glass 962a] and apatites with precambrian ages are usually undatable because their very numerous fission tracks obscure each other. The apatites dated here must have unusually low uranium concentrations. These can be estimated, probably to within a factor of 2, from the induced track densities as 0.6 ppm, 0.06 ppm and 0.015 ppm for 725, HAY-1 and 1021B respectively.

Fission Track Counts and Ages of Apatite

No.	Ts	Ti	ρ_s	ρ_i	t m.y.
725 (Non-magnetic)	NO FOSSIL OR INDUCED TRACKS FOUND				
725 (Magnetic)	281	86	$(1.04)\ 10^5$	$(8.67)\ 10^4$	247 ± 31
HAY-1	274	201	$(6.00)\ 10^3$	$(9.48)\ 10^3$	132 ± 13
1021B	163	44	$(1.23)\ 10^4$	$(2.25)\ 10^3$	1060 ± 180

Ts = Number of fossil tracks counted

Ti = Number of neutron-induced tracks counted

ρ_s = Number of fossil tracks /cm^2

ρ_i = Number of neutron-induced tracks/cm^2